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PESTICIDE-LACED PREDATOR BAITS: CONSIDERATIONS FOR PROSECUTION AND SENTENCING

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PESTICIDE-LACED PREDATOR BAITS: CONSIDERATIONS FOR PROSECUTION AND SENTENCING

by

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The illegal use of pesticide-laced baits for predator control is a wildlife crime that is underreported, inadequately documented, and insufficiently punished. The crime occurs when some ranchers, farmers, and hunting groups illegally lace baits with pesticides to control avian and mammalian predators. The activity has poisoned birds protected by the Endangered Species Act, Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. However, because of difficulties in discovering, reporting, and confirming the baitings and the wildlife kills, the crimes often appear inconsequential. The limited knowledge of these crimes in the public, regulatory, and judicial arenas distorts their importance for some prosecutors and judges. The United States' pesticide regulatory system has positioned federal and state prosecutors

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and judges in a critical role for protecting wildlife from the illegal practice of lacing baits with pesticides.

In this Article, Nimish B. Vyas, James W. Spann, Eric Albers, and Don Patterson explore the wildlife crime of the illegal use of pesticide-laced baits for predator control. They provide an overview of the crime and describe the ways in which the crime is investigated. They then present investigative and experimental evidence on the extent of the illegal practice and the magnitude of the kills in order to elucidate their importance with respect to prosecution and sentencing. The authors conclude by recommending that sufficient resources be made available, public awareness and education increased, and persistent prosecution occur in order to improve the effectiveness of all federal wildlife enforcement.

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I. INTRODUCTION

The evaluation of the extent of a wildlife crime depends on how readily the adverse effects can be detected, related to the cause, and understood in terms of its consequences to the animal. For example, injury to wildlife from a pesticide application is more easily recognized upon discovery of dead animals as contrasted to observations of normal appearing animals with elevated liver enzyme levels. Despite their definitive nature, mortality events are illusive and consequently influence how prosecutors and judges view wildlife crimes. This Article highlights one type of wildlife crime: the illegal use of pesticide-laced baits for predator control. It provides an overview of the crime, presents investigative and experimental evidence about the nature of the crime, describes challenges faced by wildlife law enforcement personnel in documenting the crime, and discusses the role of prosecutors and judges in addressing the crime.

II. BACKGROUND

The deliberate illegal use (abuse) of pesticides on baits for controlling predators is cause for investigation by federal and state wildlife law enforcement personnel in the United States. Commonly used predator baits include animal carcasses, meat patties, fish, eggs, and commercial pet food that are either injected or covered with high concentrations of liquid, granular, or powder formulations of highly toxic pesticides. The baits are placed by some ranchers, poultry and game bird farmers, and hunting establishments to control feral dogs, coyotes, foxes (Family *Canidae*), feral cats (*Felis catus*), skunks (Family *Mustelidae*), northern raccoons (*Procyon lotor*), Virginia opossums (*Didelphis virginiana*), and birds of prey (Order *Falconiformes* [vultures, eagles, harriers, hawks, and falcons] and Order *Strigiformes* [owls]). The scavenging feeding behavior of these animals subjects them to high risk of intentional and accidental poisonings at the bait sites,[1] and the resulting mortality patterns are influenced by bait

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[1] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers B0000-300-10 (1989); B0000-503-09 (1977); B0000-503-10 (1972); B0000-503-44 (1985); I000116-008 (1989); I000463-001 (1992); I000637-001 (1993); I000805-001 (1989); I000915-001 (1990); I000923-001 (1990); I000923-002 (1990); I001596-002 (1993); I001600-001 (1992); I001606-001 (1991); I001606-002 (1992); I001606-005 (1992);

size. Scavengers may prefer to take small baits (*e.g.*, small animals, animal parts, meat patties) away from the bait sites before consuming them, producing death patterns that may be scattered across a landscape. Larger baits (*e.g.*, deer and sheep carcasses) are too heavy to be carried off and are usually eaten at the bait sites, resulting in a concentrated mortality pattern wherein carcasses of scavengers that fed on the bait, and of animals that scavenged on the bait's victims, are found either at or near the source of the poison.

In the United States, sodium cyanide, sodium fluoroacetate, and sodium nitrate are the only pesticides registered for mammal predator control.[2] No pesticide in the United States is registered for controlling birds of prey. The three compounds are classified as restricted-use pesticides and require a licensed applicator. The use of these pesticides is specifically defined with regards to their method of use and target animals:

(1) Sodium cyanide is registered for use only with a M-44 ejector device for controlling coyotes, foxes, and wild dogs. The M-44 is baited with a scent attractant and when an animal pulls on the device, it propels the pesticide into mouth of the predator.[3]
(2) Sodium fluoroacetate, or Compound 1080, is registered for use on livestock collars for controlling coyotes. When a coyote bites the throat of a livestock animal wearing the collar, the predator receives the pesticide.[4]
(3) Sodium nitrate is registered as a gas cartridge for

I001606-006 (1990); I001606-007 (1989); I001606-008 (1993); I001606-009 (1994); I001606-010 (1993); I001606-011 (1994); I001606-012 (1994); I002352-001 (1992); I005419-002 (1990); I005419-003 (1990); I005503-001 (1989); I005505-001 (1990); I005543-021 (1997); I008694-001 (1998); I009840-001 (2000); I009970-002 (1999); I009970-003 (1999); I010439-002 (2000).

[2] ENVTL. SERVS. & ANIMAL & PLANT INSPECTION SERV., U.S. DEP'T OF AGRIC., WILDLIFE SERVICES PESTICIDE REGISTRATIONS, *at* http://www.aphis.usda.gov/ppd/es/wsregs.html (last visited May 31, 2003).

[3] OFFICE OF PREVENTION, PESTICIDES, & TOXIC SUBSTANCES, U.S. ENVTL. PROT. AGENCY, PUB. NO. EPA 738-R-94-020, REREGISTRATION ELIGIBILITY DECISION (RED): SODIUM CYANIDE 3 (1994), *available at* http://www.epa.gov/oppsrrd1/REDs/3086.pdf.

[4] OFFICE OF PREVENTION, PESTICIDES, & TOXIC SUBSTANCES, U.S. ENVTL. PROT. AGENCY, PUB. NO. EPA 738-R-95-025, REREGISTRATION ELIGIBILITY DECISION (RED): SODIUM FLUOROACETATE 2–3 (1995), *available at* http://www.epa.gov/oppsrrd1/REDs/3073.pdf.

fumigating coyotes, foxes, and skunks in their burrows.[5]

The fact that no pesticide is registered for controlling birds of prey and that the three pesticides that are registered for predator control are regulated in terms of who can apply them, how they should be applied, and which animals are to be controlled, greatly assists in determining pesticide abuse during investigations.

When illegal baitings are investigated, the suspects may be prosecuted under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for using "any registered pesticide in a manner inconsistent with its labeling."[6] If wildlife carcasses associated with the bait are found, the suspects may also be charged with violations of the Endangered Species Act,[7] the Bald and Golden Eagle Protection Act,[8] the Migratory Bird Treaty Act,[9] and various state laws. The evidence essential for a conviction includes:

1) recovery of the bait;
2) detection of a pesticide on the bait;
3) determination of links between the suspect and pesticide use;
4) recovery of the wildlife carcasses killed from the bait;
5) detection of the pesticide either in or on the wildlife; and
6) results of biochemical analyses, when appropriate, to ascertain the pesticide exposure.

The first three pieces of evidence are needed to prosecute for violations of FIFRA, but all of the above are required for conviction under the wildlife laws.

The success of gathering the evidence necessary for a conviction depends on how soon and how thoroughly an investigation occurs after the onset of wildlife mortalities. The vastness of the areas where baiting occurs as well as private property restrictions preclude regular patrolling

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[5] OFFICE OF PESTICIDE PROGRAMS, U.S. ENVTL. PROT. AGENCY, REREGISTRATION ELIGIBILITY DECISION (RED): INORGANIC NITRATE/NITRITE (SODIUM AND POTASSIUM NITRATES) 2–3 (1991), *available at* http://www.epa.gov/oppsrrd1/REDs/old_reds/4052red.pdf.

[6] Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) § 12, 7 U.S.C. § 136j (2000).

[7] Endangered Species Act (ESA) § 9, 16 U.S.C. § 1538 (2000).

[8] 16 U.S.C. § 668a (2000).

[9] 16 U.S.C. § 703 (2000).

by wildlife law enforcement agents, forcing investigations to be dependent on public reportings. The reportings by the public, in turn, are limited by ignorance that the baiting and wildlife mortality incident should be reported and to whom it should be reported, camaraderie, apathy, procrastination, and fear of prosecution.[10] Once an incident is reported to the appropriate authorities, an immediate investigation may not be possible because of the distance, terrain, weather, limited resources, and other on-going investigations.[11] Delays in the investigation and restrictions on its scope increase the interval between the time of the wildlife mortality and carcass collection. This time gap increases the chances that critical wildlife evidence may disappear or disintegrate before it can be recovered. The quality and quantity of the evidence can be compromised by scavenging on the bait's victims by other animals, decomposition of the bait and its victims, and deception and intentional destruction by the perpetrators.[12]

The obstacles in discovering a baiting event and its wildlife kill, and in confirming that the kill is from the pesticide used on the bait, skew the perception of the activity's occurrence and harm. Some prosecutors may decline to prosecute baiting cases and some judges may impose negligible penalties for the offenses either because they perceive the baiting events as isolated incidents, or because only a few dead birds were found during an investigation. Two lines of evidence to elucidate the extent and magnitude of the practice are provided below.

A. Investigative Evidence on the Breadth of the Practice and Wildlife Mortality

Information illustrating the extent of the baitings is drawn from reports, statements of suspects and witnesses, and confessions of perpetrators. Examples 1–3 portray the geographical breadth of the

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[10] *See* U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I000923-001 (1990); I000463-001 (1992); I000463 (1993); U.S. FISH & WILDLIFE SERV., DEP'T OF THE INTERIOR, REPORT OF INVESTIGATION: DEAD GOLDEN EAGLES; TIMBER LAKE, SOUTH DAKOTA R-3 (1995) [hereinafter REPORT OF INVESTIGATION].

[11] *See* Nimish B. Vyas, *Factors Influencing the Estimation of Pesticide-related Wildlife Mortality*, 15 TOXICOLOGY & INDUS. HEALTH 186 (1999), *available at* http://www.abcbirds.org/pesticides/Pesticidemortalityestimation.htm.

[12] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers B0000-503-09 (1977); I000463; I000463-001; I005503-001 (1989); I005505-001 (1990); I000805-001 (1989); I000915-001 (1990); I000923-001; *see* REPORT OF INVESTIGATION, *supra* note 10, at Attach. 4.

illegal baiting activity.

Example 1: Several quail farms in at least five southern states (Georgia, Florida, Alabama, Mississippi, and Louisiana) use the same method of injecting eggs with the same pesticide to control predators of game birds.[13] Pesticide-spiked eggs have also been used to kill animals for their fur in South Dakota.[14] These examples show the regional channeling of the baiting knowledge within the game bird farming community and the use of similar methods in other parts of the United States.

Example 2: Certain ranchers from South Dakota and Kansas laced carcasses with pesticides based on successes of others in their state and in the neighboring states of Montana and Wyoming.[15] In one case, the hired hand told the rancher that this was a common activity in Wyoming and that he used to participate in it.[16] In another case, a South Dakota rancher stated that when he notified his neighbors prior to placing baits for coyotes on his land, some of his neighbors requested him to also apply baits on their land.[17] The knowledge of this technique is also frequently shared with other family members.[18] Instances such as these indicate that the practice is common and accepted.

Example 3: Excerpts of statements made by Canadian wildlife officials from a newspaper article on baiting incidents involving birds of prey in the province of Saskatchewan also document the broad reach of this practice. "At least 15 [birds of prey] have died after eating meat laced with toxic insecticides. The birds perished at various locations throughout the province during the last 18 months. We've probably only found a small number of the eagles killed. In Colorado, Montana, and Wyoming, this has been reported before. It appears ranchers are finding out about it and applying it here."[19] This newspaper story highlights the international extent of the practice in North America.

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[13] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I009970-003 (1999); I009970-002 (1999); I010439-002 (2000).

[14] Mary Van Beusekom, *Olivet Man Fined for Poisoning Animals*, ARGUS LEADER, Nov. 16, 1994, at 1B.

[15] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I000463-001; I000463.

[16] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case number I000923-001.

[17] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I005503-001; I000805-001.

[18] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I008694-001 (1998); I005503-001; I000805-001; I000923-001.

[19] James Parker, *Coyote Control Killing Eagles*, STARPHOENIX, Feb. 22, 1999, at A3.

Examples 4–7 illustrate the magnitude of wildlife deaths from the illegal pesticide-laced baits.

Example 4: Perpetrators in Texas placed chicken carcasses soaked in pesticide to control predation on fighting cocks over a period of a year. An unknown number of animals died.[20] The wildlife loss in this example cannot be documented because the past kills were never detected by wildlife officials.

Example 5: Investigators recovered one dead hawk from a South Dakota ranch with pesticide-laced baits, but it was reported that additional birds died during the previous three to four baiting events over the past year.[21] This case shows that the recovery of one bird does not connote only one mortality or a one-time baiting activity.

Example 6: When first interviewed about the eagle kills discovered on his property, the subject rancher denied any knowledge of the mortalities and poison use. Only after a pre-trial diversion agreement did the rancher admit to poisoning twenty to sixty eagles over the past five years. When required to provide a more accurate account of the eagles killed, the rancher provided a second statement acknowledging forty to sixty eagle deaths. However, a confidential informant stated that the actual number of dead eagles was between eighty and one hundred birds. None of these eagle kills were investigated because none were reported. A neighboring rancher had observed two dead eagles on the subject rancher's land two years prior to the current investigation but did not report them at the time. The number of hawks, owls, and other birds killed and the number of eagles killed prior to the past five years remain unknown.[22] This example documents the extensive practice of using pesticide-laced baits and underscores how a large scale injury to wildlife can go undetected.

Example 7: A serendipitous find of dead eagles by wildlife officials along a road initiated an investigation that revealed sixty-eight dead birds of prey from a property used for commercial pheasant hunting. Birds had been killed using a variety of pesticide-laced food items over a one-year period. The carcasses found ranged from old sun-bleached bones to recent mortalities. No one had reported this activity despite the large numbers of birds killed and the visibility of some of the

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[20] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case number I001596-002 (1993).

[21] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case number I000923-002 (1990).

[22] *See generally* REPORT OF INVESTIGATION, *supra* note 10.

carcasses from roadside.[23] The example highlights the fact that the paucity of wildlife mortality reportings to officials does not imply absence of poisonings.

B. Experimental Evidence on the Fate of Poisoned Birds

The effectiveness of the investigative evidence is dependent on finding wildlife carcasses. In order to understand the chances of finding a carcass after a baiting event has been reported, we conducted an experiment to document the fate of bird carcasses at bait sites.

1. Methods

We used white-tailed deer (*Odocoileus virginianus*) carcasses to represent the illegally poisoned baits. Deer carcasses were placed roughly in the center of fields (3.9 - 15.9 ha) that were surrounded by woodlands within the Patuxent Research Refuge, U. S. Fish and Wildlife Service, Laurel, MD. We placed domestic turkey (*Meleagris gallopavo*) carcasses at three of the simulated bait sites and northern bobwhite quail (*Colinus virginianus*) carcasses at one site to represent mortalities of birds that had fed on the bait. We monitored scavenging on the deer and bird carcasses by animals on the Patuxent Research Refuge to document the fate of the baits and their victims. No carcasses used in this study were exposed to pesticides.

Domestic turkeys were from two body weight classes: eleven small turkeys (body weight range: 1.5 - 2.6 kg) were used to simulate the body mass of red-tailed hawks (*Buteo jamaicensis,* body weight range: 0.7 - 1.6 kg), and three large turkeys (body weight range: 5.5 - 5.8 kg) represented golden eagles (*Aquila chrysaetos*) and bald eagles (*Haliaeetus leucocephalus*, body weight range: 2.0 - 6.4 kg).[24] Ten quail (body weight range: 0.18 - 0.21 kg) represented smaller avian scavengers (*e.g.*, magpies, *Pica* spp., body weight range: 0.13 - 0.21 kg).[25] A range of avian weights was used to take into account the influence of body mass on carcass removal by scavengers.

During an actual investigation of a pesticide-laced bait site, the

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[23] Telephone Interview with Robert Prieksat, Senior Resident Agent, Division of Law Enforcement, U.S. Fish & Wildlife Service (Oct. 21, 2002).

[24] WILLIAM S. CLARK, A FIELD GUIDE TO HAWKS OF NORTH AMERICA 74, 85, 91 (1987).

[25] CRC HANDBOOK OF AVIAN BODY MASSES 198 (John B. Dunning, Jr. ed., 1993).

immediate vicinity of a large bait is the best-searched area by law enforcement agents, and wildlife carcasses close to the bait are the most likely to be found. Larger scale searches are constrained by the availability of personnel and funding and the carcass recovery rates usually drop as the carcass search is broadened. Therefore, our bird carcasses were randomly placed within a 50-m radius of each deer, simulating mortalities of birds of prey most likely to be found during an actual investigation. The location of each bird's placement was mapped to determine its fate. Intensive avian carcass searches were conducted in concentric circles from the location where each bird was placed and by following tracks left by feathers as the birds were dragged away by scavengers. The bird carcasses were placed only after the animals on the refuge had begun scavenging on the deer in order to simulate bird of prey mortalities following their scavenging on the bait. Additional bird carcasses were added to the bait site only as long as scavenging by the refuge animals continued on the deer to represent the duration of palatability of the bait. We ended observations at a bait site when the deer was no longer palatable to the refuge animals, implying that at an actual pesticide-laced bait site no additional birds would die from that bait.

Weather data during the experiment periods (June - August, 1997-2001) were obtained from the U. S. Department of Agriculture's Beltsville Agricultural Research Center Weather Station #3, located 3 - 3.6 km from the simulated bait sites.

Deer 1 was placed in the field (day 0) and was surrounded by three small turkeys on day 1. One small turkey and one large turkey were added to the site on day 4. Deer 2 was surrounded by three small turkeys on day 1 and one small turkey and one large turkey on day 3, post deer placement (day 0). One small turkey was placed near deer 3 on day 1 and two small turkeys and one large turkey were placed on day 2 post deer placement (day 0). Observations on scavenging were made daily up to day 5 post deer placement.

Five quail carcasses were placed around deer 4 on days 2 and 4 post deer placement (day 0). Scavenging on deer was recorded on days 2, 4, and 6, and scavenging on the quail was documented on days 4 and 6.

Based on our serendipitous observations of animals, dens, and scat, possible scavengers at our study sites can include: dogs (*Canis familiaris*), gray foxes (*Urocyon cinereoargenteus*), red foxes (*Vulpes vulpes*), cats, northern raccoons, Virginia opossums, red-tailed hawks

(*Buteo jamaicensis*), red-shouldered hawks (*Buteo lineatus*), bald eagles, turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), and great horned owls (*Bubo virginianus*).

2. Results

The animals at the Patuxent Research Refuge scavenged the deer baits and the bird carcasses. Scavenging quickly removed the bird evidence, which would be necessary to document the ecological harm from a pesticide-laced bait.

a. Scavenging on the Deer

Deer 1 was scavenged on day of the first turkey carcass placement. The deer was moved and the lower jaw bone was broken. By the last day of the study, the deer had undergone significant putrification and decomposition (the skin had blackened and maggots had reduced the body tissue). Two turkey vultures were observed feeding on deer 2 on day 1 post placement. The eyes, mouth, upper left forelegs, and rectum of the deer had been fed upon by the scavengers. By day 2, the deer carcass was deflated and on day 3 the head and neck had decomposed. The deer skin had turned black and the hair had sloughed off. Within twenty-four hours post placement, the left rump and hind leg of deer 3 were gone. Additional scavenging was observed during the next two days. Deer 4 exhibited signs of scavenging and decomposition on the day of the first quail carcass placement. The deer's face and hindquarters were scavenged and the carcass was bloated. Further scavenging and decomposition of the deer was observed on the day of the second quail placement. The deer carcass had been dragged approximately one meter from the original position.

b. Scavenging on the Bird Carcasses

The scavenging on the deer carcasses did not detract the scavengers from also feeding on the birds. Of the twenty-four bird carcasses, twenty-one (87.5%) were not recovered during carcass searches. Of the twenty-one birds, no traces were detected for four small turkeys and ten quail, whereas only feathers were found for five small turkeys and two large turkeys. These birds were possibly removed from the fields, cached, or pulled into dens by scavengers. The

remaining carcasses (two small turkeys, one large turkey) were recovered partially eaten in nearby tall grass clumps.

Six small turkeys and all three large turkeys were scavenged within twenty-four hours post placement. Two small turkeys were scavenged by the second day and the remaining three small turkeys were fed upon by day 3 of placement. All ten quail were removed by scavengers by the first search period (forty-eight hours post placement) but it is probable that at least some of the quail were scavenged within twenty-four hours of placement.

c. Weather During the Test Periods

The maximum/minimum temperatures during the study periods were 31.7°C/11.6°C and the humidity range was 40% - 104%. The rainfall amounts during these periods ranged from 0 mm - 18 mm.

III. DISCUSSION OF THE INVESTIGATIVE AND EXPERIMENTAL EVIDENCE

The investigative evidence shows illegal baitings to be pervasive but shrouded, thereby appearing uncommon and inconsequential. The results of our experiment show that scavengers can quickly reduce the bird carcass evidence by the time an investigation is conducted, thus reducing the perception of the harm to wildlife. The bones found during the actual investigations and the feathers left behind by seven of twenty-one bird carcasses that were removed by scavengers in our experiment imply wildlife loss, but in the legal arena they could be considered as circumstantial evidence of poisoning without additional information. The investigative and experimental evidence underscore the fact that while each individual mortality event may not seem consequential, the sum effect is large.

Baits can quickly attract scavengers.[26] The scavengers may prefer

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[26] *See generally* B. Heinrich, *Winter Foraging at Carcasses by Three Sympatric Corvids, with Emphasis on Recruitment by the Raven,* Corvus corax, 23 BEHAV. ECOLOGY & SOCIOBIOLOGY 141 (1988); W. Don Bowen, *Variation in Coyote Social Organization: The Influence of Prey Size*, 59 CANADIAN J. ZOOLOGY 639 (1981); George M Linz et al., *Estimating Survival of Bird Carcasses in Cattail Marshes*, 19 WILDLIFE SOC'Y BULL. 195 (1991); Gary Wobeser & A.G. Wobeser, *Carcass Disappearance and Estimation of Mortality in a Simulated Die-off of Small Birds*, 28 J. WILDLIFE DISEASES 548 (1992); N. Vern Marr et al., *Sheep Carcass Availability and Use by Bald Eagles*, 107 WILSON BULL. 251 (1995); Marco Restani et al., *Numerical and Functional Responses of Migrant Bald Eagles*

the bait's victims over the larger bait carrion because of the ease of manipulating the smaller carcasses and the freshness of the victims. Feeding on the bait kills the scavengers whereas scavenging on the victims by other animals results in removal of wildlife mortality evidence and in some cases, mortality of the scavengers themselves. Examples of such secondary poisonings include hawk and fox deaths after feeding on a European starling (*Sturnus vulgaris*) and a rodent, both poisoned by the bait, respectively, and an eagle mortality after scavenging on a bait-poisoned coyote.[27] Studies reported in scientific literature on scavenging have also shown high rates of carcass removal over a short period of time.[28] Stutzenbaker, et al.,[29] demonstrated that low density die-offs are difficult to detect and that wildlife carcasses are most likely to be found in a large scale die-off where the number of animals that died exceeds the capabilities of scavengers. However, Douthwaite[30] and Linz, et al.,[31] found that scavenging was more rapid in areas of higher carcass density than in lower density kills because the clumped food source attracted scavengers. Therefore, depending on the magnitude of the kill and the scavenger population, even a short interval between the mortality event and an investigation may result in poor carcass recoveries.

Carcass putrification and decomposition rates depend on carcass size, temperature, rainfall, humidity, and invertebrate density and diversity.[32] The rate of the deer carcass putrification and decomposition determines how quickly the bait loses its palatability to scavengers and, hence, ceases to attract them. In our study, the interval between deer placement and the onset of its putrification and decomposition provided

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Exploiting a Seasonally Concentrated Food Source, 102 CONDOR 561 (2000); Christy A. Peterson et al., *Scavenging of Waterfowl Carcasses by Birds in Agricultural Fields of British Columbia*, 72 J. FIELD ORNITHOLOGY 150 (2001).

[27] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I000463-001 (1992); I000463 (1993); I001600-01 (1992); I005503-001 (1989); I000805-001 (1989).

[28] Vyas, *supra* note 11.

[29] C.D. Stutzenbaker et al., *Special Report: An Assessment of the Accuracy of Documenting Waterfowl Die-offs in a Texas Coastal Marsh*, *in* LEAD POISONING IN WILD WATERFOWL – A WORKSHOP 88–95 (J. Scott Feierabend & A. Brooke Russell eds., 1984).

[30] R.J. Douthwaite, *Changes in Pied Kingfisher (*Ceryle rudis*) Feeding Related to Endosulfan Pollution from Tsetse Fly Control Operations in the Okavango Delta, Botswana*, 19 J. APPLIED ECOLOGY 133 (1982).

[31] Linz et al., *supra* note 26.

[32] Jerry A. Payne, *A Summer Carrion Study of the Baby Pig* Sus scrofa *Linnaeus*, 46 ECOLOGY 592 (1965); K. Tullis & M. Lee Goff, *Arthropod Succession in Exposed Carrion in a Tropical Rainforest on Oahu Island, Hawaii*, 24 J. MED. ENTOMOLOGY 332 (1987).

ample opportunity for scavenger visitations, but the high rate of scavenging precluded our observations on the bird carcass putrification and decomposition. Actual poison-laced baits may be placed during the winter, reducing the decaying process and extending viability of the bait.[33]

IV. IMPLICATIONS OF THE EVIDENCE AND REGULATORY AND JUDICIAL CONSIDERATIONS

The difficulty in discovering the baits and wildlife kills leads to their under-reporting. The U.S. Fish and Wildlife Service, Division of Law Enforcement, archives all the cases it investigates; however, this information is difficult to obtain because of the lack of a searchable database. The obstacles in documenting the baiting events and in obtaining information on the known events have left conservationists in the United States largely ignorant of these environmental crimes. In the research arena, we found only three sources in the scientific literature that addressed the issue of bird of prey mortalities from the illegal pesticide-laced baits in the United States.[34] In the public arena, information on illegal baitings was found only in a bulletin from the Texas Department of Agriculture and in newsletters from the Federal Wildlife Officers Association.[35] In the United Kingdom, by contrast, professional and public knowledge about illegal baitings is greater than in the United States because of several technical government publications[36] and concerted efforts such as The Campaign Against

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[33] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case number I000463-001 (1992).

[34] *See* George T. Allen et al., *Winter Poisoning of Coyotes and Raptors with Furadan-laced Carcass Baits*, 32 J. WILDLIFE DISEASES 385 (1996); Richard K. Stroud & William J. Adrian, *Forensic Investigational Techniques for Wildlife Law Enforcement Investigations*, *in* NONINFECTIOUS DISEASES OF WILDLIFE 3 (Anne Fairbrother et al. eds., 2d ed. 1996); Pierre Mineau et al., *Poisoning of Raptors with Organophosphorus and Carbamate Pesticides with Emphasis on Canada, U.S. and U.K.*, 33 J. RAPTOR RES. 1 (1999).

[35] TEXAS DEP'T OF AGRIC., PREVENTING PESTICIDE MISUSE IN CONTROLLING ANIMAL PESTS, *available at* http://www.agr.state.tx.us/pesticide/brochures/pdfs/pes_misuse.pdf (last visited May 31, 2003); FED. WILDLIFE OFFICERS ASS'N, FWOA NEWSLETTERS, *at* http://www.fwoa.org/fwoanews.html (last visited May 31, 2003).

[36] G.A. Hamilton et al., *Wildlife Deaths in Scotland Resulting from Misuse of Agricultural Chemicals*, 21 BIOLOGICAL CONSERVATION 315 (1981); P.W. Greig-Smith, *Wildlife Hazards from the Use, Misuse and Abuse of Pesticides*, 17 ASPECTS OF APPLIED BIOLOGY 247 (1988); P.W. GREIG-SMITH ET AL., U.K. MINISTRY OF AGRIC., FISHERIES & FOOD, PESTICIDE POISONING OF ANIMALS 1989: INVESTIGATIONS OF SUSPECTED INCIDENTS

Illegal Poisoning of Wildlife launched by the Ministry of Agriculture, Fisheries, and Food and the Department of the Environment, Transport and the Regions and supported by several major non-governmental organizations representing animal welfarists, conservationists, and sportsmen.[37]

The lack of public knowledge about the illegal poisoned baits in the United States has rendered this issue onto the regulatory back-burner. The U.S. Environmental Protection Agency (EPA) regulates pesticide registrations and a pesticide is registered for use if, "when used in accordance with widespread and commonly recognized practice, the product will not generally cause unreasonable adverse effects on the environment."[38] However, EPA excludes from its pesticide registration and re-registration processes the harm from the compounds when used to lace baits, despite the evidence that it is a commonly recognized practice for some pesticides. The pesticide industry has absolved itself of responsibility for the ecological damage that their products create when used on baits because the use is not as they specified on their product label. The burden of protecting the wildlife, therefore, falls on federal and state wildlife law enforcement agents and federal and state prosecutors and judges.

EPA's Ecological Incident Information System contains at least thirty-six pesticide-laced baiting incidents where bird of prey mortalities were recovered. These incidents include turkey vulture and black vulture, a northern harrier (*Circus cyaneus*), red-tailed hawks, a ferruginous hawk (*Buteo regalis*), golden eagles and bald eagles, and a

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IN GREAT BRITAIN: A REPORT OF THE ENVIRONMENTAL PANEL OF THE ADVISORY COMMITTEE ON PESTICIDES (1990); M. R. FLETCHER ET AL., U.K. MINISTRY OF AGRIC., FISHERIES & FOOD, PESTICIDE POISONING OF ANIMALS 1998: INVESTIGATIONS OF SUSPECTED INCIDENTS IN THE UNITED KINGDOM: A REPORT OF THE ENVIRONMENTAL PANEL OF THE ADVISORY COMMITTEE ON PESTICIDES (1999), *available at* http://www.pesticides.gov.uk/citizen/wiis98.pdf; E.A. BARNETT ET AL., U.K. MINISTRY OF AGRIC., FISHERIES & FOOD, PESTICIDE POISONING OF ANIMALS 1999: INVESTIGATIONS OF SUSPECTED INCIDENTS IN THE UNITED KINGDOM: A REPORT OF THE ENVIRONMENTAL PANEL OF THE ADVISORY COMMITTEE ON PESTICIDES (2000), *available at* http://www.pesticides.gov.uk/citizen/wiis99.pdf; E.A. BARNETT ET AL., U.K. DEP'T FOR ENV'T, FOOD & RURAL AFFAIRS, PESTICIDE POISONING OF ANIMALS 2000: INVESTIGATIONS OF SUSPECTED INCIDENTS IN THE UNITED KINGDOM: A REPORT OF THE ENVIRONMENTAL PANEL OF THE ADVISORY COMMITTEE ON PESTICIDES (2002), *available at* http://www.pesticides.gov.uk/citizen/wiis2000.pdf.

[37] PESTICIDES SAFETY DIRECTORATE, U.K. DEP'T FOR ENV'T, FOOD & RURAL AFFAIRS, HELP STOP ILLEGAL POISONING OF WILDLIFE, *at* http://www.pesticides.gov.uk/citizen/caip.htm (last visited May 31, 2003).

[38] FIFRA § 3, 7 U.S.C. § 136a (2000).

great horned owl. The incidents are from seventeen states and the pesticide products containing the active ingredient carbofuran account for twenty-nine of the incidents, followed by products containing the active ingredients strychnine (three), aldicarb (three), and terbufos (one). These pesticides are preferred by the perpetrators because of their acute toxicity, but their concentrations on the baits can exceed 8,000 times the amount needed to kill an animal.[39] The list of pesticides, states, and victims presented here is not exhaustive and it is biased by the low discovery, low reporting, and low investigation rates, and inconsistent report submissions to EPA by federal and state wildlife and agriculture agencies. The sum of all reports, nevertheless, remains a fraction of the actual numbers of pesticide-laced baiting events and wildlife mortalities. The known incidents, therefore, represent a small but precious evidence signifying a widespread pattern of pesticide abuse and wildlife loss. The paucity of the number of baiting events and wildlife mortalities are a reflection of their clandestine nature and the limitations of investigative resources.

V. CONCLUSION

The pesticide regulatory system in the United States has left prosecution as the only deterrent for these crimes and has positioned federal and state prosecutors and judges in a pivotal role. However, wildlife law enforcement agents investigating illegal baitings have difficulty convincing some prosecutors to accept the cases, and some judges do not impose stiff penalties for the offenses. Reluctance on their part may stem from:

1) poor knowledge about the extent and magnitude of these crimes; therefore, the crimes do not appear charismatic enough to warrant review for possible charges or to impose stiff sentencing unless large numbers of dead birds or endangered species are involved;
2) insufficient experience with wildlife statutes and case law; and
3) the lack of interest in pursuing the misdemeanor

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[39] *See generally* GREGORY J. SMITH, DEP'T OF THE INTERIOR, RESOURCE PUB. 170, PESTICIDE USE AND TOXICOLOGY IN RELATION TO WILDLIFE: ORGANOPHOSPHORUS AND CARBAMATE COMPOUNDS (1987); U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case numbers I005503-001 (1989); I000805-001 (1989); I005419-003 (1990).

violations of the Endangered Species Act, Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act.

Baiting is widespread and the injury to wildlife should be considered significant. As the investigative and experimental evidence show, the discovery of just one baiting event does not connote isolated activity but suggests an ongoing practice, and the recovery of just one bird carcass from a bait site does not imply that only that bird has died but presents the probability of a larger kill. As the investigative evidence shows, the baiting and mortality events would never have been discovered and would probably have continued had the perpetrators not been apprehended during their most recent poisoning effort. Because it is impossible for law enforcement agents to catch all offenders, the cases where evidence is available must be pursued seriously. Under the federal sentencing guidelines, most first offenses of the above statutes do not carry a mandatory prison sentence; however, the magnitude of the kill can affect the sentencing guidelines and result in a more appropriate sentence. Therefore, demonstrating to the court the potential magnitude of the kill through an extrapolation based on the actual number of dead birds collected becomes a critical element of the prosecution.

The effectiveness of federal wildlife law enforcement is threatened due to limited financial and personnel resources and this reduces the chances of conducting timely investigations. We urge that sufficient resources be made available to support their efforts. In some instances, prosecutors have aggressively pursued environment cases and judges have imposed stiff sentences on the perpetrators and we request them to share their enthusiasm and experiences with others in their field. We also suggest collaboration among conservation groups, farming and ranching organizations, the pesticide industry, and government regulatory and enforcement agencies to increase public awareness that the practice is both illegal and harmful to wildlife. Public education should also encompass the lacing of baits with nonpesticide chemicals such as ethylene glycol.[40] Scavenging, decomposition, putrification, and pesticide breakdown can reduce the evidence; therefore, prosecutors and law enforcement agents should communicate with wildlife

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[40] U.S. Envtl. Prot. Agency, Ecological Incident Information System, Case number I001606-008 (1991).

biologists on the forensic research needed to improve the quality of the evidence, thereby increasing the chances for convictions. Persistent prosecution of these environmental crimes is necessary not only to deter future criminal activity, but also to document critical information on the extent of illegal baiting activity.